Section 3 Prevention, Collection, and Elimination

3.1 Current Status of Mercury Prevention, Collection, and Elimination

Mercury prevention, collection, and elimination can reduce the need for treatment and disposal over the long run. These practices intend to on prevent pollution from currently used mercury products, collecting discarded mercury products and mercury waste removal from commerce and the reduction or elimination of mercury use. There are many programs underway in EPA, state and local organizations to facilitate all three of these practices.

3.2 Issues in Mercury Prevention, Collection, and Elimination

Mercury Waste and Product Collection. Municipalities and international communities have undertaken mercury-containing product take-back and collection programs designed to remove all unnecessary mercury from use. These include the voluntary thermometer trade-in programs operating in many municipalities that offer free or discounted digital thermometers in exchange for mercury thermometers, as well as large-scale programs such as Sweden's virtual elimination program which uses inspectors and mercury-sniffing dogs to identify and label mercury-bearing products. While these programs often remove large amounts of mercury from use, two potential limitations to these programs have been identified. One drawback is the potential for inefficient collection practices to result in release of mercury to the atmosphere. This occurs because mercury volatilizes at ambient temperatures; consequently, great care must be taken to ensure that collected products do not break. The second drawback is the increasing saturation of the secondary mercury market. While collection of mercury does remove a potential hazard from the consumer, it may leave agencies with ever-increasing stockpiles of mercury due to the over-saturated secondary market.

Mercury Source Reduction. A long-term method for reducing the need for mercury treatment and disposal along with the hazards from mercury use is source reduction, the preferred method for pollution prevention. Source reduction is the reduction or elimination of the use of mercury in products and processes; thereby, reducing the demand for mercury entering the marketplace. Source reduction efforts may include the utilization of mercury substitutes, such as NewMerc™; the reduction of mercury use in products, such as the low-mercury fluorescent lamps; and the use of alternative technologies, such as digital thermometers versus conventional mercury thermometers. These substitutes may not befeasible for all applications, because they do not reproduce the same characteristics of mercury. However, there are many applications where these substitute chemicals and technologies will be sufficient.

Identification of Pollution Prevention Opportunities. Since pollution prevention (P2) can be applied to a wide range of industries, EPA has taken the lead in identifying P2 opportunities for mercury source reduction. EPA has initiated a P2 Prioritization Assessment which will guide the development of P2 opportunities.

Mercury Dogs. Swedish agencies use mercury-sniffing dogs to identify mercury in products and wastes.

Middle-level Handling of Mercury. Currently, industries that collect mercury-containing instruments such as thermostats and thermometers are not regulated. The government is promoting incentives to encourage collection efforts that are economically viable without releasing mercury into the environment. Regulation of this collection program is typically done at the state and local level. For example, Minnesota regulates collectors under the universal hazardous waste rule and have obtained good oversight of their activities.

EPA received a petition from the Edison Electric Institute to add all mercury-containing devices to the Universal Waste Rule to help better manage these devices. Utilities also use mercury instruments such as temperature and pressure sensors within their processes. EPA has not yet acted on this petition.

3.3 Additional Topics of Concern from Prevention, Collection, and Elimination Panel Discussion

The panel discussion on prevention, collection, and elimination focused on the need to reduce the amount of mercury entering the waste stream through improved pollution prevention techniques, waste collection methods, and source reduction. The proceedings of this panel discussion are included as Appendix B to this report. This section highlights the recurring themes that drove the discussion of the panel members and attendees.

The panelists were asked to respond to four questions:

1. What are the two or three most important insights you want to convey to the audience regarding the management of mercury from non-combustion sources?

2. What are the two or three most critical/essential efforts that need to be undertaken to prevent, eliminate, treat, or dispose of mercury from non-combustion sources?

2. Name two or three data gaps or information needs for mercury risk management from non-combustion sources.

4. Prioritize the two or three most important research needs for managing risks from non-combustion sources of mercury.

Conclusions:

Cooperation. Cooperation is essential both within industries and between industry and regulators. The chlor-alkali industry realized that some plants can manage at mercury control better than others, and they can all learn from each other without engaging in uncompetitive practices. The industry as a whole has realized that working with regulators toward a common goal can allow both parties to maximize their limited resources.

Set Achievable Goals. It is important to set achievable goals in eliminating mercury use and reducing mercury waste. Total elimination is not practical since mecury is mobile and is persistent in the environment (i.e., multimedia). A risk-based approach to determining an acceptable and achievable level of mercury in products processes and waste is more practical. The chlor-alkali industry has publically committed to a goal of a 50% reduction in mercury use (using a 1990-95 baseline) by 2005. A few companies, including Vulcan Chemicals, have set a goal of a 50% mercury consumption reduction based on a 1999 baseline. The industry intends to achieve these goals through cooperation with the regulatory community. Most plants are on track to achieving their goals.

Although the U.S. chlor-alkali industry have not planned a phase-out of mercury in the U.S. any phase-out needs to be well-planned as a cooperative venture between the government and industry. An immediate phase-out could have unintended consequences. For example, any disruption in alkali production could force alkali prices to rise and spur increases in production elsewhere in the world, such as Mexico, where chlor-alkali facilities are subject to less stringent environmental regulations.

Members of the chlor-alkali industry have worked together to address the following issues:

- *Mercury in Sodium Hydroxide.* The chlor-alkali industry's mercury in sodium hydroxide task group is about to release a draft publication that details the best strategy available on minimizing mercury in sodium hydroxide.
- *Mercury Health Issues.* The chlor-alkali industry has also convened a mercury health issues task group that has looked into ensuring that the best science is used to provide worker safety at chlor-alkali facilities.
- *Mercury Balance.* George Gissel stated that Vulcan Chemicals has assessed its mercury balance since 1973. Other chlor-alkali companies have looked toward this example to assist them in establishing a mercury balance. Vulcan Chemicals has given several seminars to the chlor-alkali industry about mercury balance. Through a multi-year evaluation of mercury consumption and purchasing, a facility can gain a better understanding of minimizing mercury consumption and losses.
- *Cross-plant/Cross-industry Sharing for Continuous Improvement.* The chlor-alkali industry formed the mercury control task group to identify the best management practices. This task group has produced two in-plant technology exchange workshops in 1999, with a third planned for 2000. These workshops provide detailed descriptions on using specific technologies.

The chlor-alkali industry has worked with the EPA to address the following issues:

- *Measuring Cell Room Fugitive Emissions.* The chlor-alkali industry formed a mercury emissions measurement task group to work with the EPA toward a common goal of measuring cell room fugitive emissions. The EPA at Research Triangle Park (RTP) developed the protocol. Testing began at the Olin Corporation's Augusta, Georgia, facility. The Chlorine Institute covered the out-of-pocket costs of Olin Corporation and the EPA is underwriting the cost of the equipment and measurements.
- *Revising National Emissions Standards for Hazardous Air Pollutants (NESHAP) regulations.* The EPA worked with the chlor-alkali industry revising the NESHAP regulations. They are conducting audits at five facilities.

Pursue Voluntary Efforts. Although voluntary efforts are not always effective, there are more successes than failures. Experience with the chlor-alkali industry shows that voluntary efforts can yield positive results.

Encourage Office of Solid Waste (OSW) Efforts. The EPA should support OSW in researching alternative disposal technologies.

Enhance Technology Development and Verification Programs. To enhance technology development and verification of alternative mercury technologies, the EPA should look at complementarity between ORD's Small Business Innovative Research (SBIR) program and Environmental Technology Verification (ETV) program.

Support Environmentally Preferable Purchasing. Use federal procurement to achieve environmentally preferable purchasing by reducing mercury in commerce.

International Mercury Flows. The EPA needs to support efforts to measure international flows of mercury. Characterizing the international flows are critical to assessing and addressing background mercury levels. Like many other countries, there is currently neither mercury monitoring nor a mercury inventory in Mexico. At present, Mexico is building its first large scale coal-fired utility plant. Mexican environmental officials have identified that they have three mercury cell chlor-alkali facilities. The Chlorine Institute and Eurochlor are working with their Mexican counterparts to raise their level of concern toward mercury issues as well as raise plant performance efficiencies. An unintended consequence of a rapid closure of mercury cell chlor-alkali plants in the U.S., could be a demand for more chlor-alkali plants in foreign countries with fewer environmental controls.

Virtual Elimination of Mercury Requires Private Sector Cooperation. Previous discussions during the workshop concluded that new regulations restricting mercury use are not likely. Therefore, if mercury is to be removed from the marketplace, government must work closely with the private sector. The challenge is to create positive incentive programs that can encourage the private sector to make business from phasing out mercury use; both in terms of developing alternative disposal technologies and developing chemical

substitutes (such as NewMerc).

Mercury as a Consumer Products Safety Issue. Mercury can be thought of as a consumer products safety issue where it exists in small amounts, such as in thermometers and electronic displays. The most common calls to poison hotlines deal with broken mercury fever thermometers. Although, thermometers and electronic displays represent a small percentage of mercury emissions (especially when compared with utility coal emissions), they still present a risk. It is recommended that the Consumer Products Safety Commission could be used to address the mercury safety issue.

Educating the Public about Mercury Exposures. Although most of this workshop has focused on emissions rather than on exposures, educating the public on exposures is critical. Over 90% of the calls to a poison control center in a certain state was attributed to broken fever thermometers.Yet, while most people may know that there is mercury in their thermometers, they may not be aware of the mercury in their thermostats or cars. The public needs to better understand through communication the risks of mercury in their everyday life.

Categorization. A standard categorization scheme for mercury disposition and contamination starting with products and ending with releases can help communicate risks and corrective action. The Northeast Model Legislation proposes the following categorization scheme:

- Product with elemental mercury
- Product with compounds and chemicals
- Processes
- Waste streams of the three above areas of deliberate use
- Non-combustion incidental releases, including refining, mining, and cement and limestone production

Mercury-free Procurement/Buildings by Government. It is important for the government to become a model for a mercury-free environment by setting an example for the public and industry.

Mercury in Consumer Products. The intentional use of mercury in consumer products should eventually be phased out, including mercury in lamps. A gatekeeper, such as EPA's hazardous waste listing determination, would provide some consistency in how regulations treat industry as well as the consumer. For example, there is no gatekeeper controlling the mercury found in Drano.
Some states have regulations in place, but there is nothing enforced at the national level. Minnesota has a provision in its regulations that prohibit mercury disposal in its solid wastes and wastewaters, where solid wastes include construction and demolition non-hazardous industrial, etc.

Data Gaps and Research Needs

Division of Mercury Sources by Deliberate Use and Trace Contamination of Raw Materials. Categorizing mercury sources by emissions resulting from mercury use and emissions resulting from

contamination of raw materials may be more relevant than categorizing by combustion and non-combustion for the following reasons:

- *Avoids the disparity of equating combustion emissions with coal-fired utility emissions.* As currently defined by EPA, combustion sources include incinerators. Incinerators, however, do not make mercury, but receive mercury from mercury-containing wastes as a result of mercury use in products;.
- *Normalizes the division of mercury sources.* If emissions are categorized on a deliberate use basis, use-related emissions are about 50% of total emissions; combustion basis, where combustion-related emissions constitute about 90% of total emissions.
- *Better consideration of life cycle emissions.* Since incinerator emissions represent the end of a product's life cycle, this type of assessment makes it easier to look at different points along a product's life cycle to assess opportunities to control mercury emissions.

Life Cycle Emissions by Product Type. There is an inadequate understanding of life cycle emissions by product type. Further research may help prioritize mercury collection efforts and target programs to critical sectors. There are some data on mercury emissions from mercury-containing products, however these estimates do not seem to be based on actual measurements. There are better data from incinerators, but these data could also be improved. However, there is a paucity of data regarding emissions estimates from other phases of the mercury product life cycle, in particular:

- Accidental emissions that occur during product use;
- Emissions associated with collecting, processing, storage, and transport of wastes prior to incineration;
- Emissions that occur from landfills, particularly the working faces of landfills;
- Mercury emissions from the use of metal scrap. For example, emissions from mercury switches placed in automobiles are currently not accounted for in EPA emissions estimates, though these emissions could be significant.

Increase Focus on Prevention Opportunities. Currently cost effectiveness data are based on cost effectiveness per mass of mercury collected rather than on the prevention of mercury releases. More emphasis should be place on the following areas for prevention efforts:

- *Auto industry*. There should be more research on this sector since most of the mercury associated with automobiles is ultimately released into the environment.
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- *Electrical Switches*. Alexis Cain cited data presented by Bruce Lawrence (Bethlehem Apparatus Company) in the plenary session indicating that electrical products, particularly mercury relays in capital equipment, are now the largest user of mercury in the U.S. (even more than the chlor-alkali industry); now estimated at 110 tons per year. Moreover, mercury use in electrical switches has not decreased over the past 20 years.

Mercury Retirement. As the secondary market grows and mercury use shrinks, an "end-game" for mercury must be devised for retiring mercury. The EPA should work with the Department of Energy (DOE) and Department of Defense (DOD) to develop mercury stabilization technologies. Ultimately, all of the mercury in commerce needs to be treated, contained and/or sequestered in a final disposition.